IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of: J. Rodney Walton, et al.	§	Confirmation No.: 4445
Serial No.: 10/781,951	§	Group Art Unit: 2474
Filed: February 18, 2004	§	Examiner: Curtis A. Alia
For: TRANSMIT DIVERSITY AND SPATIAL SPREADING FOR AN OFDM-BASED MULTI-ANTENNA COMMUNICATION SYSTEM	§	Customer No. 23696
	§	Docket No. 040235

MAIL STOP: APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Dear Sir:

Applicants submit this Appeal Brief to the Board of Patent Appeals and Interferences on appeal from the decision of the Examiner of Group Art Unit 2416 dated March 3, 2010, finally rejecting claims 1-23 and 63. The final rejection of claims 1-23 and 63 is appealed. This Appeal Brief is believed to be timely since it is transmitted by the due date of July 27, 2010, as set by the filing of a Notice of Appeal on May 27, 2010.

The Commissioner is authorized to charge Deposit Account No. 17-0026 for the requisite Appeal Brief fee of $540.00.

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Real Party in Interest

The present application has been assigned to QUALCOMM Incorporated, San Diego, California.

Related Appeals and Interferences

No other appeals or interferences are known to the Applicants, the Applicants' legal representatives or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

Status of Claims

Claims 1-23 and 63 are pending in the application. Claims 1-62 were originally presented in the application. Claims 24-62 were cancelled. Claim 63 was added. Claims 1-23 and 63 stand finally rejected as discussed below. This Appeal is taken from the final rejections of claims 1-23 and 63. The pending claims are shown in the attached Claims Appendix.

Status of Amendments

All claim amendments have been entered by the Examiner. No amendments to the claims were proposed after the final rejection.

Summary of Claimed Subject Matter

The inventions claimed herein generally provide apparatus and methods for detecting data streams (see, e.g., FIGs. 6-7 and paragraphs [0066]-[0086]).

A. CLAIM 1 – INDEPENDENT

The inventions claimed in independent claim 1 recite a method of transmitting data from a transmitting entity to a receiving entity in a wireless multi-antenna communication system utilizing orthogonal frequency division multiplexing (OFDM). The method generally includes processing a data packet to obtain a block of data symbols, demultiplexing pilot symbols and the block of data symbols onto a plurality of subbands to obtain, for the data packet, a plurality of sequences of pilot and data symbols for the plurality of subbands, and performing spatial processing on at least one of the pilot and data symbols for each subband with at least one steering vector selected for the subband, the spatial processing randomizing a plurality. (FIG. 4, paragraphs [0058]-[0060]).

B. CLAIM 14- INDEPENDENT

The inventions claimed in independent claim 14 recite an apparatus in a wireless multi-antenna communication system utilizing orthogonal frequency division multiplexing (OFDM). The apparatus generally includes a data processor operative to process a data packet to obtain a block of data symbols, a demultiplexer operative to demultiplex pilot symbols and the block of data symbols onto a plurality of subbands to obtain, for the data packet, a plurality of sequences of pilot and data symbols for the plurality of subbands, and a spatial processor operative to perform spatial processing on at least one of the pilot and data symbols for each subband with at least one steering vector selected for the subband, the spatial processing randomizing a plurality of effective single-input single-output (SISO) channels observed across the plurality of subbands. (FIG. 3, paragraphs [0049]-[0053] and FIG. 4, paragraphs [0058]-[0060]).

C. CLAIM 19 – INDEPENDENT

The inventions claimed in independent claim 19 recite an apparatus in a wireless multi-antenna communication system utilizing orthogonal frequency division multiplexing (OFDM). The apparatus generally includes means for processing a data packet to obtain a block of data symbols, means for demultiplexing pilot symbols and the block of data symbols onto a plurality of subbands to obtain, for the data packet, a plurality of sequences of pilot and data symbols for the plurality of subbands, and means for performing spatial processing on at least one of the pilot and data symbols for each subband with at least one steering vector selected for the subband, the spatial processing randomizing a plurality of effective single-input single-output (SISO) channels observed across the plurality of subbands. (FIG. 3, paragraphs [0049]-[0053] and FIG. 4, paragraphs [0058]-[0060]).

D. CLAIM 63 – INDEPENDENT

The inventions claimed in independent claim 63 recite a memory unit for processing data for transmission from transmitting data from a transmitting entity to a receiving entity in a wireless multi-antenna communication system utilizing orthogonal frequency division multiplexing (OFDM) comprising a memory, the memory having instructions stored thereon, the instructions being executable by one or more processors. The instruction generally include instructions for processing a data packet to obtain a block of data symbols, instructions for demultiplexing pilot symbols and the block of data symbols onto a plurality of subbands to obtain, for the data packet, a plurality of sequences of pilot and data symbols for the plurality of subbands, and instructions for performing spatial processing on at least one of the pilot and data symbols for each subband with at least one steering vector selected for the subband, the spatial processing randomizing a plurality of effective single-input single-output (SISO) channels observed across the plurality of subbands. (FIG. 3, paragraphs [0049]-[0053] and FIG. 4, paragraphs [0058]-[0060]).

Grounds of Rejection to Be Reviewed on Appeal

1. Provisional rejection of claims 1-23 and 63 under 35 U.S.C. § 101 as claiming the same invention as that of claims 1-8, 10-24 and 65 of copending Application No. 10/794,918.

2. Rejection of claims 1-3, 5, 14-15, 19-20 and 63 under 35 U.S.C. § 103(a) as being unpatentable over *Trikkonen et al.* (U.S. Publication 2004/0002364, hereinafter, "*Trikkonen*") in view of *Onggosanusi et al.* (U.S. Publication 2002/0114269, hereinafter, "*Onggosanusi*").

ARGUMENTS

1. Provisional rejection of claims 1-23 and 63 under 35 U.S.C. § 101 as claiming the same invention as that of claims 1-8, 10-24 and 65 of copending Application No. 10/794,918.

Applicants respectfully request this rejection be held in abeyance because (i) no claim in the present application is currently allowable and (ii) the application on which the rejection is made has not issued.

2. Rejection of claims 1-23 and 63 under 35 U.S.C. § 103(a) as being unpatentable over *Trikkonen* in view of *Onggosanusi*.

The Applicable Law

The Examiner bears the initial burden of establishing a prima facie case of obviousness. See MPEP § 2141. Establishing a prima facie case of obviousness begins with first resolving the factual inquiries of *Graham v. John Deere Co.*, 383 U.S. 1 (1966). The factual inquiries are as follows:

(A) determining the scope and content of the prior art;

(B) ascertaining the differences between the claimed invention and the prior art;

(C) resolving the level of ordinary skill in the art; and

(D) considering any objective indicia of nonobviousness.

Once the *Graham* factual inquiries are resolved, the Examiner must determine whether the claimed invention would have been obvious to one of ordinary skill in the art.

The Examiner's Argument

For example, as stated in response to the previous Office Action (dated September 21, 2009), despite the Examiner's contention, *Trikkonen* fails to teach "demultiplexing pilot symbols and the block of data symbols onto a plurality of subbands to obtain, for the data packet, a plurality of sequences of pilot and data symbols for the plurality of subbands" as recited in claim 1. The Examiner concedes that *Trikkonen* fails to teach that the "the spatial processing" recited

in claim 1 "is performed for each subband." However, the Examiner relies on paragraphs [0041]-[0043] of *Onggosanusi* as teaching this element.

Applicants' Response to the Examiner's Argument

In this case, Applicants respectfully submit the Examiner has not properly characterized the teachings of the references and, as a result, has failed to ascertain differences between the claimed invention and the prior art.

For example, despite the Examiner's contention, Applicants respectfully submit that *Trikkonen* fails to teach "demultiplexing pilot symbols and the block of data symbols onto a plurality of subbands to obtain, for the data packet, a plurality of sequences of pilot and data symbols for the plurality of subbands" as recited in claim 1. In contrast, *Trikkonen* teaches, in paragraph [0059] that:

> ... The training or pilot signal is sent independently of the data stream and is used by the receiver to provide an estimated value for the channel transfer model.

Clearly, there is no teaching of obtaining "for the data packet, a plurality of sequences of pilot and data symbols for the plurality of subbands." Rather, pilots are sent "independently of the data stream."

In the Advisory Action, the Examiner states that "*Trikonnen* teaches ...a plurality of pilot/training and data symbols are transmitted by a transmitter across multiple antennas (MSAA) and are received by a base station that receives all of the pilot/training and data symbols, which must then be separated, downconverted, recombined and have other processes performed on them to return them to their original digital form (see paragraphs 60-61)..." Applicants respectfully submit, however, that this is not the same as the claim 1 feature of "demultiplexing pilot symbols and the block of data symbols onto a plurality of subbands to obtain, for the data packet, a plurality of sequences of pilot and data symbols for the plurality of subbands."

The Examiner concedes that *Trikkonen* fails to teach that the "the spatial processing" recited in claim 1 "is performed for each subband." However, the Examiner relies on paragraphs [0041]-[0043] of *Onggosanusi* as teaching this element. As stated in response to the previous

Office Action, however, Applicants respectfully submit that there is no teaching in these cited paragraphs that spatial processing is performed "on at least one of the pilot and data symbols *for each subband with at least one steering vector selected for the subband*."

To emphasize, the claim recites that spatial processing is performed with *a steering vector selected for each subband*. There is no such teaching in *Onggosanusi*.

In the Advisory Action, the Examiner states that "*Onggosanusi* teaches transmitting data across multiple antennas, where the data is transmitted using a subchannel (subband) index value and beamformer value. Beamforming is spatial processing, and paragraph [0041] indicates that for each transmission, a specific value for a beamformer vector and a specific value for a frequency index (subband) is selected..."

Even if, for the sake of argument, a "beamformer vector" is equivalent to a "steering vector," Applicants respectfully submit that *Onggosanusi* fails to teach spatial processing is performed "*on at least one of the pilot and data symbols for each subband with at least one steering vector selected for the subband"* as recited in claim 1. As noted in the Examiner's response above, a single "beamformer vector" and frequency index is selected for each transmission.

Each of independent claims 14, 19 and 63 includes features substantially similar to those of claim 1, and are therefore also allowable over the art of record for at least the reasons given above. Accordingly, Applicants submit claims 1, 14, 19, and 63, as well as their dependents are allowable over the art of record and respectfully request withdrawal of this rejection.

CONCLUSION

Applicants respectfully request the provisional double-patenting rejection be held in abeyance. The Examiner errs in finding that claims 1-23 and 63 are unpatentable over *Trikkonen* in view of *Onggosanusi*.

Withdrawal of the rejections and allowance of all claims are respectfully requested.

Respectfully submitted,
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Date: July 20, 2010

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CLAIMS APPENDIX

1. (Previously Presented) A method of transmitting data from a transmitting entity to a receiving entity in a wireless multi-antenna communication system utilizing orthogonal frequency division multiplexing (OFDM), comprising:

processing a data packet to obtain a block of data symbols;

demultiplexing pilot symbols and the block of data symbols onto a plurality of subbands to obtain, for the data packet, a plurality of sequences of pilot and data symbols for the plurality of subbands; and

performing spatial processing on at least one of the pilot and data symbols for each subband with at least one steering vector selected for the subband, the spatial processing randomizing a plurality of effective single-input single-output (SISO) channels observed across the plurality of subbands.

2. (Previously Presented) The method of claim 1, wherein the pilot and data symbols for each subband is spatially processed with one steering vector selected for the subband.

3. (Previously Presented) The method of claim 2, wherein a plurality of different steering vectors is used for the plurality of subbands.

4. (Previously Presented) The method of claim 2, wherein the one steering vector used for the spatial processing of each subband is unknown to the receiving entity.

5. (Previously Presented) The method of claim 1, wherein the pilot and data symbols for each subband is spatially processed with at least two steering vectors selected for the subband.

6. (Previously Presented) The method of claim 1, wherein one pilot or data symbol is sent on each subband in each symbol period, and wherein the pilot and data symbols for each subband is spatially processed with a different steering vector for each symbol period.

7. (Original) The method of claim 1, wherein the at least one steering vector used for spatial processing for each subband is known only to the transmitting entity and the receiving entity.

8. (Original) The method of claim 1, wherein the spatial processing with the at least one steering vector for each subband is performed only on data symbols.

9. (Original) The method of claim 1, wherein the processing a data packet includes encoding the data packet in accordance with a coding scheme to obtain coded data, interleaving the coded data to obtain interleaved data, and

symbol mapping the interleaved data in accordance with a modulation scheme to obtain the block of data symbols.

10. (Original) The method of claim 1, further comprising:

selecting the at least one steering vector for each subband from among a set of L steering vectors, where L is an integer greater than one.

11. (Original) The method of claim 10, wherein the L steering vectors are such that any pair of steering vectors among the L steering vectors have low correlation.

12. (Original) The method of claim 6, further comprising:

selecting a steering vector for each subband in each symbol period from among a set of L steering vectors, where L is an integer greater than one.

13. (Original) The method of claim 1, wherein each steering vector includes T elements having same magnitude but different phases, where T is the number of transmit antennas at the transmitting entity and is an integer greater than one.

14. (Previously Presented) An apparatus in a wireless multi-antenna communication system utilizing orthogonal frequency division multiplexing (OFDM), comprising:

a data processor operative to process a data packet to obtain a block of data symbols;

a demultiplexer operative to demultiplex pilot symbols and the block of data symbols onto a plurality of subbands to obtain, for the data packet, a plurality of sequences of pilot and data symbols for the plurality of subbands; and

a spatial processor operative to perform spatial processing on at least one of the pilot and data symbols for each subband with at least one steering vector selected for the subband, the

spatial processing randomizing a plurality of effective single-input single-output (SISO) channels observed across the plurality of subbands.

15. (Previously Presented) The apparatus of claim 14, wherein the spatial processor is operative to spatially process the pilot and data symbols for each subband with one steering vector selected for the subband.

16. (Previously Presented) The apparatus of claim 14, wherein the spatial processor is operative to spatially process the pilot and data symbols for each subband with at least two steering vectors selected for the subband.

17. (Original) The apparatus of claim 16, wherein the at least two steering vectors for each subband are known only to a transmitting entity and a receiving entity for the data packet.

18. (Original) The apparatus of claim 14, wherein each steering vector includes T elements having same magnitude but different phases, where T is the number of antennas used to transmit the data packet and is an integer greater than one.

19. (Previously Presented) An apparatus in a wireless multi-antenna communication system utilizing orthogonal frequency division multiplexing (OFDM), comprising:

means for processing a data packet to obtain a block of data symbols;

means for demultiplexing pilot symbols and the block of data symbols onto a plurality of subbands to obtain, for the data packet, a plurality of sequences of pilot and data symbols for the plurality of subbands; and

means for performing spatial processing on at least one of the pilot and data symbols for each subband with at least one steering vector selected for the subband, the spatial processing randomizing a plurality of effective single-input single-output (SISO) channels observed across the plurality of subbands.

20. (Previously Presented) The apparatus of claim 19, wherein the pilot and data symbols for each subband is spatially processed with one steering vector selected for the subband.

21. (Previously Presented) The apparatus of claim 19, wherein the pilot and data symbols for each subband is spatially processed with at least two steering vectors selected for the subband.

22. (Original) The apparatus of claim 21, wherein the at least two steering vectors for each subband are known only to a transmitting entity and a receiving entity for the data packet.

23. (Original) The apparatus of claim 19, wherein each steering vector includes T elements having same magnitude but different phases, where T is the number of antennas used to transmit the data packet and is an integer greater than one.

25-62. (Cancelled)

63. (Previously Presented) A memory unit for processing data for transmission from transmitting data from a transmitting entity to a receiving entity in a wireless multi-antenna communication system utilizing orthogonal frequency division multiplexing (OFDM) comprising a memory, the memory having instructions stored thereon, the instructions being executable by one or more processors and the instructions comprising:

instructions for processing a data packet to obtain a block of data symbols;

instructions for demultiplexing pilot symbols and the block of data symbols onto a plurality of subbands to obtain, for the data packet, a plurality of sequences of pilot and data symbols for the plurality of subbands; and

instructions for performing spatial processing on at least one of the pilot and data symbols for each subband with at least one steering vector selected for the subband, the spatial processing randomizing a plurality of effective single-input single-output (SISO) channels observed across the plurality of subbands.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.